The evaluation of singing voice accuracy: Are we good judges even if we are not musicians?

SMPC
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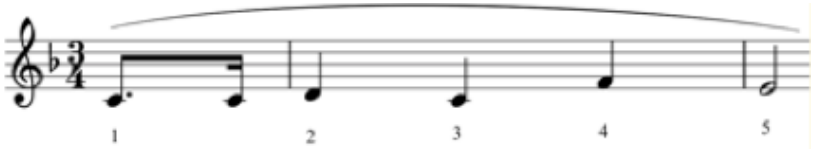
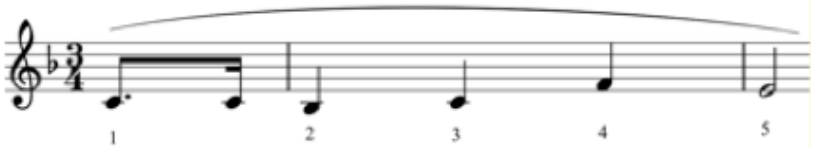
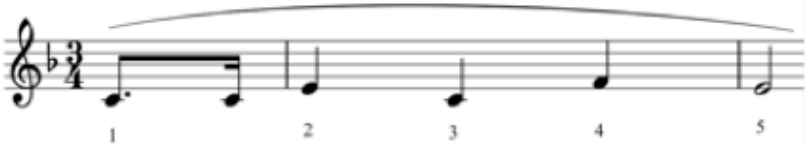
What is “in tune” ?



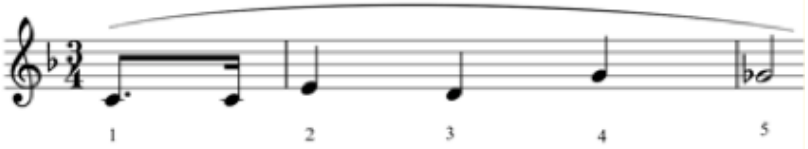
Accurate version



Contour error at the note 2



Interval errors of 200 cents between notes 1-2 and 2-3



Tonality modulation at the note 2

How to evaluate the vocal accuracy ?

Overview

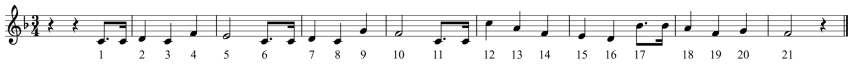
- Self-evaluation
  - Asking the singer himself
    - **Difficult** (Cuddy et al., 2005; Sloboda et al., 2005; Wise & Sloboda, 2008)
    - **Under-estimation** (Pfordresher & Brown, 2007)
- Music experts
  - Grids, scales, global score
    - e.g. Alcock et al., 2000a, 2000b; Hébert et al., 2003; Lévêque et al., 2012; Racette et al., 2006; Schön et al., 2004; Wise & Sloboda, 2008
- Computer-assisted method
  - Acoustic analyses, extraction F0, computation of errors
    - e.g. Dalla Bella & Berkowska, 2009; Dalla Bella et al., 2007; Lévêque et al., 2009; Pfordresher & Brown, 2007; Pfordresher et al., 2010

Are music experts good judges?

Larrouy-Maestri, Lévêque, Schön, Giovanni, & Morsomme, D. (2013)

Acoustic analyses

166 sung performances



http://sldr.org/sldr000774/en

18 Musicians

Procedure described in Larrouy-Maestri & Morsomme (in press)

-Estimation of the f0 for each note

-Computation of errors

- Number of contour errors
- Mean interval deviation
- Number of modulations

1----2----3----4----5----6----7----8----9

very inaccurate very accurate

Are music experts good judges?

Larrouy-Maestri, Lévèque, Schön, Giovanni, & Morsomme, D. (2013)

- Conclusions
  - High correlation between the raters ($r = .77$, $p < .01$)
    - Same definition of vocal accuracy
  - High correlation between the two methods ($r = .87$, $p < .001$)
    - Objectivity of the judges
    - 3 judges are sufficient to keep a correlation of .85
  - 81% of the variance of the judges is explained
    - Pitch interval deviation ($\beta = 0.51$; $p < .001$)
    - Number of tonality modulations ($\beta = 0.45$; $p < .001$)
- Answer...

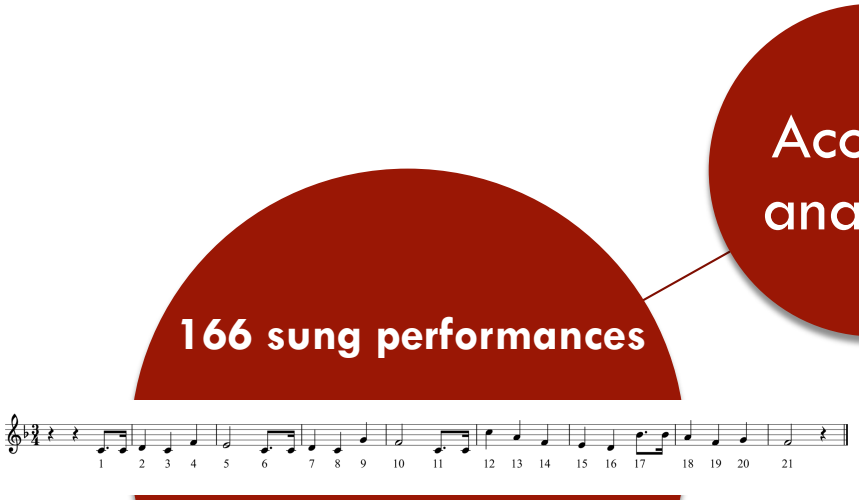
But …

Effects of music expertise	We are all experts of our culture (Bigand & Delbé, 2010)
• **Discrimination** Micheyl et al., 2006; Tervaniemi et al., 2005 • **Pitch perception** Hutchins & Peretz, 2012 • **Interval size estimation** Russo & Thompson, 2005 • **Complex tones** Hutchins et al., 2012; Vurma et al., 2010; Zarate et al., 2012 • **Error detection** Fujiroka et al., 2004; Hutchins et al., 2012 ; Warrier & Zatorre, 2002 • **Melodic recognition** Orsmond & Miller, 1999	• **Early development of melodic perception** Chang & Trehub, 1977; Ferland & Mendelson, 1989; Plantinga & Trainor, 2005; Stalinski et al., 2008 • **Enculturation** Miyamoto, 2007; Stalinski & Schellenberg, 2012; Trainor, 2005 ; Trainor et al., 2012 • **Implicit learning** Jonaitis & Saffran, 2009; Loui et al., 2010; Saffran et al., 1999; Schön et al., 2008 • **Melodic expectations** Marmel et al., 2008 • **Ability to sing in tune** Dalla Bella et al., 2007

Are we good judges ?

- Methods
- Results
- Conclusions

Methods



Procedure described in Larrouy-Maestri & Morsomme (in press)

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very inaccurate very accurate

Methods

- Participants
  - Paired in age, gender, sociocultural background
  - Non musicians
    - Less than 2 years of musical training
    - Occasional listeners
  - Audio and MBEA OK
- Procedure
  - 166 x “Happy birthday”
    - 5 lists in random order
  - Global pitch accuracy

1----2----3----4----5----6----7----8----9
very inaccurate very accurate

  - Two times (test and retest with 8-15 days in between)

Are we good judges ?

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- Results
- Conclusions

Results and discussion

Judges reliability

- Intra-judge reliability
  - Mean Spearman correlation T1/T2: .66 (SD = .06)

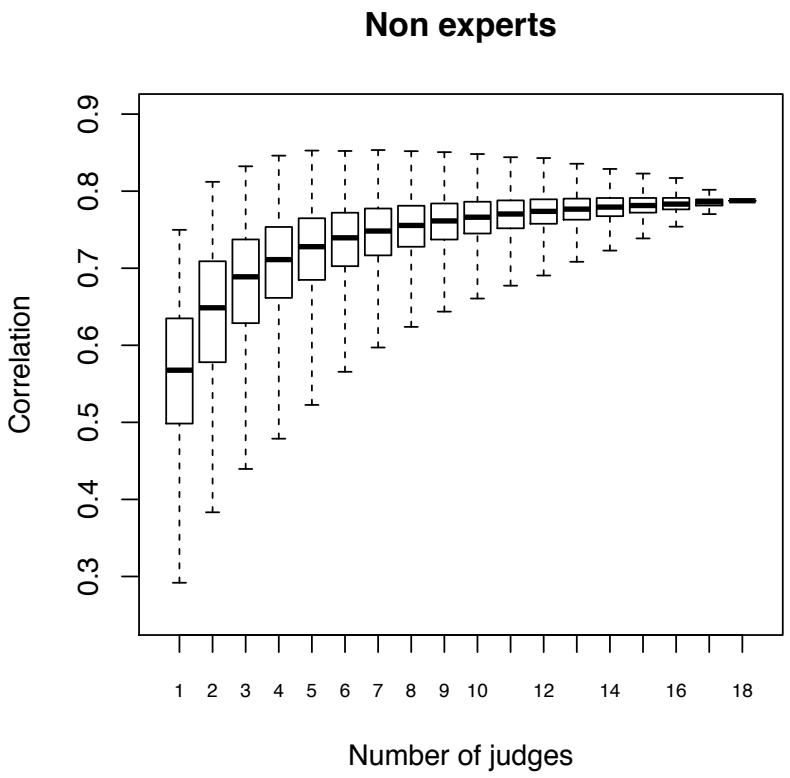
    ➔ **OK**
- Inter-judge reliability
  - Intra-class correlation coefficient: .89; $p < .01$

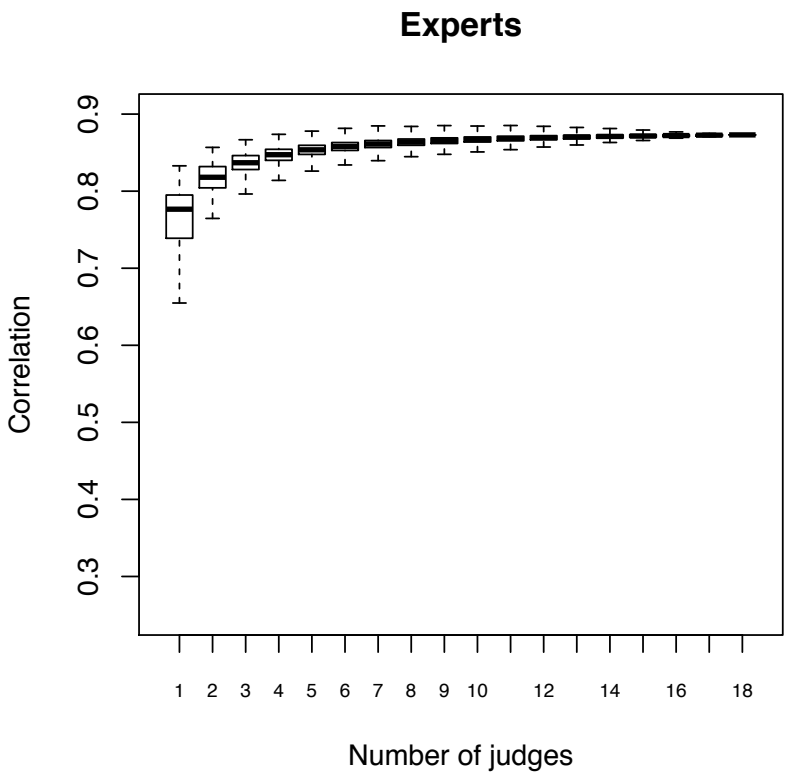
    ➔ **OK**
- Correlation with computer-assisted method
  - $r(166) = .81$; $p < .01$

    ➔ **Higher scores for accurate performances: OK**

Results and discussion

Correlation with decreased number of judges





Results and discussion

Comparison Non experts / Experts

- Comparison mean ratings
  - $r(166) = .84$; $p < .01$
  - *U Mann Whitney* $p < .01$
  - Non experts are more severe than experts
- Criteria

	Non experts	Experts
Model	$F(3,165) = 104.44$; $p < .01$	$F(3,165) = 231.51$; $p < .01$
% variance	66%	81%
Criteria	Interval deviation	Interval deviation Tonality modulations

Are we good judges ?

- Methods
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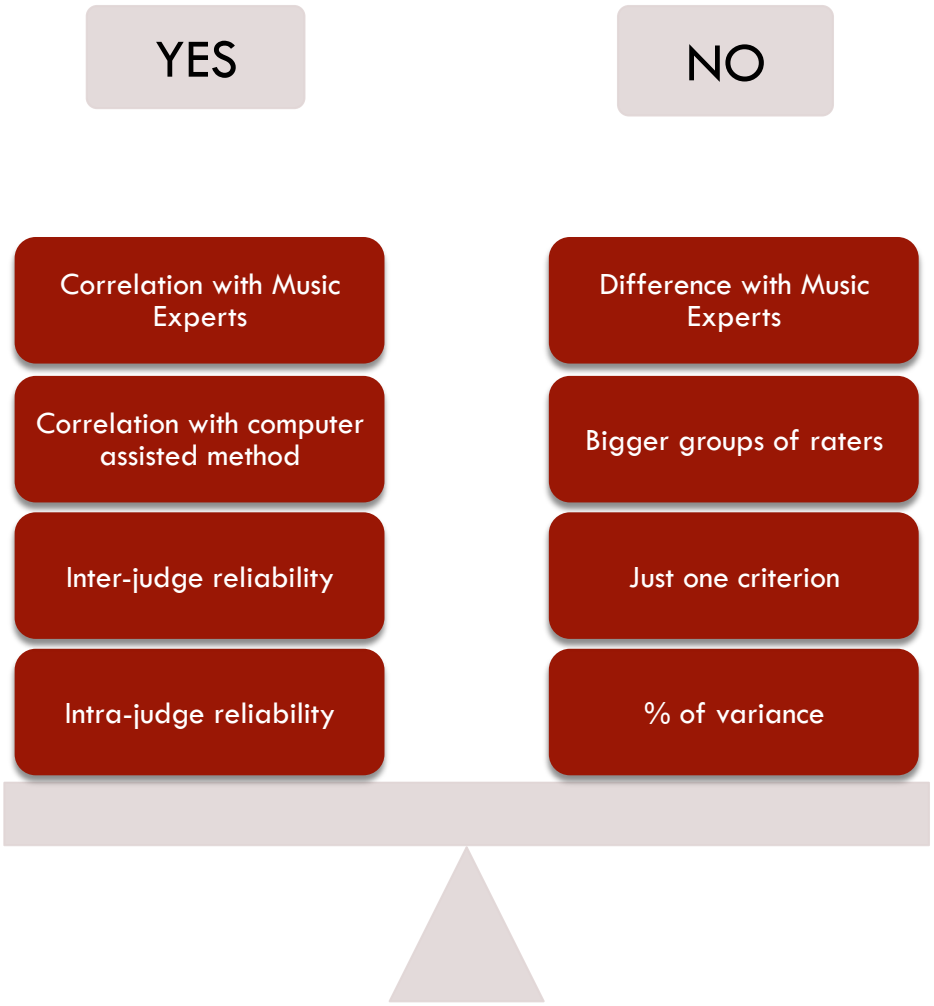
Conclusions

Are we good judges?



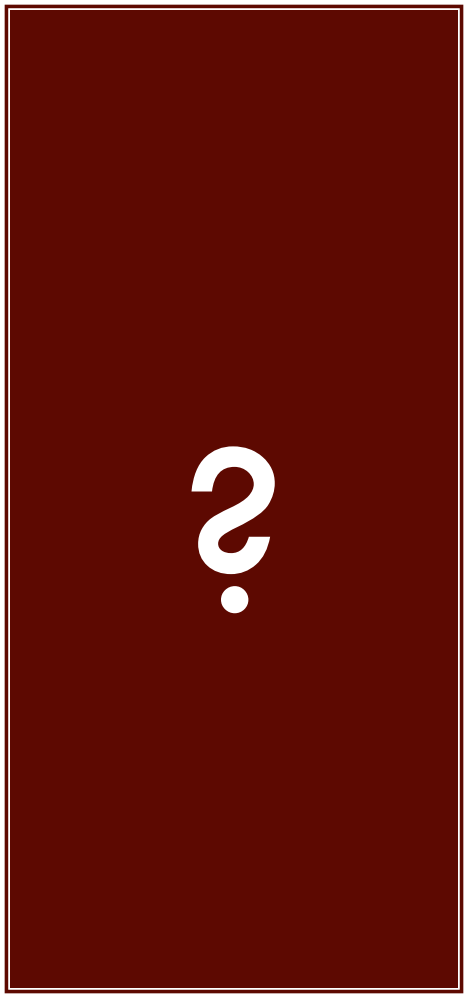
Conclusions

Are we good judges?

- Reliability and objectivity
  - Similar definition of vocal accuracy
  - Same strategy each time
  - Relationships with music experts' ratings and objective method
- However
  - More severe
  - Just sensitive to the precision of the intervals
  - 34% of the variance unexplained
- Perspectives
  - Other criteria which influence the rating of non musicians
  - Perception and tolerance of music experts and non experts

➔ Why?

The evaluation of singing voice accuracy



THANK YOU FOR YOUR ATTENTION

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